IIT Madras - Purdue University Seminar Series

Reactions Between Nanoparticles

Talk By

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Abstract of the talk:

Atom and structure conserving chemical reactions between nanoparticles are presented using two atomically precise archetypal nanoparticles, $Ag_{25}(SR)_{18}$ and $Au_{25}(SR)_{18}$ (-SR = alkyl/aryl thiolate). Despite their geometric robustness and electronic stability, reactions between them in solution produce alloys $Ag_mAu_n(SR)_{18}$ (m+n = 25), keeping their $M_{25}(SR)_{18}$ composition, structure and topology intact. [1] We captured one of the earliest events of the process, namely the formation of the dianionic adduct, $[Ag_{25}Au_{25}(SR)_{36}]^{2-}$, by electrospray ionization mass spectrometry. Molecular docking simulations and density functional theory (DFT) calculations also suggest that metal atom exchanges could occur through the formation of adducts. Such isomorphous transformations between nanoparticles imply that microscopic pieces of matter can be transformed completely to chemically different entities, preserving their structures, at least in the nanometric regime. Intercluster interactions can also produce cluster dimers[2] and unusual, well-defined alloys.[3] They reflect the shell structure of certain reactants.[4] Atom exchanges suggest interesting dynamics in solution,[5] early results of these investigations will be presented.

August 24, 2017, 4:30 pm
Wetherill Chemistry Bldg, Room 104

Speaker Bio

Thalappil Pradeep is an Institute Professor at the Indian Institute of Technology Madras, Chennai, India. He is the Deepak Parekh Institute Chair Professor and is also a Professor of Chemistry. He studied at IISc., UC Berkeley and Purdue. His research interests are in molecular and nanoscale materials and he develops instrumentation for such studies. He is an author of 392 scientific papers and over 75 patents or patent applications. In addition to the work on advanced materials, he is involved in the development of affordable technologies for drinking water purification and some of them have been commercialized. Along with his associates, he has incubated two companies and both of them have production units. He is a recipient of several awards including the Shanti Swaroop Bhatnagar Prize, BM Birla Science Prize, National Award for Nanoscience and Nanotechnology, India Nanotech Innovation Award and JC Bose National Fellowship. He is a Fellow of all the science and engineering academies of India and is a fellow of the Royal Society of Chemistry. He is a distinguished professor in a few institutions in India and is also on the graduate faculty of Purdue University. He is the author of the introductory textbook, *Nano: The Essentials* (McGraw-Hill) and is one of the authors of the monograph, *Nanofluids* and an advanced textbook, *A Textbook of Nanoscience and Nanotechnology* (McGraw-Hill). He is on the editorial boards of several journals and is an associate editor of the American Chemical Society Journal, *ACS Sustainable Chemistry & Engineering.*
Visit http://www.dstuns.iitm.ac.in/pradeep-research-group.php for more information.

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